

6/17/02

Re: 09/648,455

Examiner Owens, *AU2811, CP4-4D09*

Attached are edited search results from the patent and nonpatent literature.

I tagged the two most interesting items:

- JP 63230845 A, 9/27/88
- JP 59211547 A, 11/30/84 || JP 91032624 B, 5/14/91

If you need further searching or have questions or comments, please let me know.

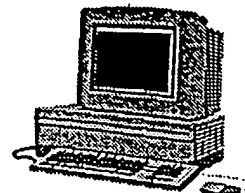
Thanks,
Jeff Harrison,
306-5429
CP4-9C18



EIC2800

Search Results

Feedback Form (Optional)



Scientific & Technical Information Center

The search results generated for your recent request are attached. If you have any questions or comments (compliments or complaints) about the scope or the results of the search, please contact *the EIC searcher* who conducted the search *or contact*:

Jeff Harrison, Team Leader, 306-5429

Voluntary Results Feedback Form

➤ *I am an examiner in Workgroup:* _____ (Example: 2830)

➤ *Relevant prior art found, search results used as follows:*

- ☐ 102 rejection
- ☐ 103 rejection
- ☐ Cited as being of interest.
- ☐ Helped examiner better understand the invention.
- ☐ Helped examiner better understand the state of the art in their technology.

Types of relevant prior art found:

- ☐ Foreign Patent(s)
- ☐ Non-Patent Literature
(journal articles, conference proceedings, new product announcements etc.)

➤ *Relevant prior art not found:*

- ☐ Results verified the lack of relevant prior art (helped determine patentability).
- ☐ Search results were not useful in determining patentability or understanding the invention.

Other Comments:

Drop off completed forms in CP4-9C18, or send to Jeff Harrison, CP4-9C18.

06-10-02 P03:53 1H

SEARCH REQUEST FORM Scientific and Technical Information Center - EIC2800
 Rev. 8/27/01 This is an experimental format - Please give suggestions or comments to Jeff Harrison, CP4-9C18, 306-5429.

Date 6/10/02 Serial # 09 1648 455 Priority Application Date _____
 Your Name Douglas W. Owens Examiner # 77017
 AU 2811 Phone 308-6167 Room 4D09
 In what format would you like your results? Paper is the default. PAPER DISK EMAIL

If submitting more than one search, please prioritize in order of need.

The EIC searcher normally will contact you before beginning a prior art search. If you would like to sit with a searcher for an interactive search, please notify one of the searchers.

Where have you searched so far on this case?

Circle: USPT DWPI EPO Abs JPO Abs IBM TDB
 Other: IEEE

What relevant art have you found so far? Please attach pertinent citations or Information Disclosure Statements.

What types of references would you like? Please checkmark:

Primary Refs ☒ Nonpatent Literature ☒ Other _____
 Secondary Refs _____ Foreign Patents ☒
 Teaching Refs ☒

What is the topic, such as the novelty, motivation, utility, or other specific facets defining the desired focus of this search? Please include the concepts, synonyms, keywords, acronyms, registry numbers, definitions, structures, strategies, and anything else that helps to describe the topic. Please attach a copy of the abstract and pertinent claims.

An aluminum (Al) conductor in a semiconductor device wherein the Al contains Copper (Cu) and Nickel (Ni). (See attached claim)

Staff Use Only

Searcher: HARRISON
 Searcher Phone: 306-5429
 Searcher Location: STIC-EIC2800, CP4-9C18
 Date Searcher Picked Up: 6-17-02
 Date Completed: 6-17-02
 Searcher Prep/Rev Time: 120
 Online Time: 35

Type of Search

Structure (#) _____
 Bibliographic ☒
 Litigation _____
 Fulltext _____
 Patent Family _____
 Other _____

Vendors

STN ☒
 Dialog ☒
 Quertel/Orbit _____
 Lexis-Nexis _____
 WWW/Internet _____
 Other _____

17jun02 11:24:09 User259284 Session D1837.2

SYSTEM:OS - DIALOG OneSearch

File 6:NTIS 1964-2002/Jun W5
 (c) 2002 NTIS, Intl Cpyrght All Rights Res

*File 6: See HELP CODES6 for a short list of the Subject Heading Codes (SC=, SH=) used in NTIS.

File 8:Ei Compendex(R) 1970-2002/Jun W3
 (c) 2002 Engineering Info. Inc.

File 94:JICST-EPlus 1985-2002/Apr W4
 (c)2002 Japan Science and Tech Corp(JST)

*File 94: There is no data missing. UDs have been adjusted to reflect the current months data. See Help News94 for details.

File 315:ChemEng & Biotec Abs 1970-2001/Dec
 (c) 2002 DECHEMA

File 350:Derwent WPIX 1963-2002/UD,UM &UP=200237
 (c) 2002 Thomson Derwent

*File 350: Please see HELP NEWS 350 for details about U.S. provisional applications. Also more updates in 2002.

File 347:JAPIO Oct 1976-2002/Feb(Updated 020604)
 (c) 2002 JPO & JAPIO

*File 347: JAPIO data problems with year 2000 records are now fixed. Alerts have been run. See 'HELP NEWS 347 for details.

File 35:Dissertation Abs Online 1861-2002/May
 (c) 2002 ProQuest Info&Learning

File 144:Pascal 1973-2002/Jun W3
 (c) 2002 INIST/CNRS

File 32:METADEx(R) 1966-2002/Aug B1
 (c) 2002 Cambridge Scientific Abs

*File 32: See Help Codes32 for a list of the Alloy Class Codes(CC=) and Alloy Class Names(CN=) used in Metadex.

File 335:Ceramic Abstracts 1976-2002/Q1
 (c) 2002 Cambridge Scientific Abs.

File 34:SciSearch(R) Cited Ref Sci 1990-2002/Jun W3
 (c) 2002 Inst for Sci Info

File 434:SciSearch(R) Cited Ref Sci 1974-1989/Dec
 (c) 1998 Inst for Sci Info

File 65:Inside Conferences 1993-2002/Jun W3
 (c) 2002 BLDSC all rts. reserv.

File 77:Conference Papers Index 1973-2002/May
 (c) 2002 Cambridge Sci Abs

Set	Items	Description
S1	8	(NI OR NICKEL) () DOPED () (AL OR ALUMINUM OR ALUMINIUM)
S2	68	(CU OR COPPER) () DOPED () (AL OR ALUMINUM OR ALUMINIUM)
S3	2297	DOPED () (AL OR ALUMINUM OR ALUMINIUM)
S4	214286	(AL OR ALUMINUM OR ALUMINIUM) (W) ALLOY????
S5	163254	(CU OR COPPER) (8N) (AL OR ALUMINUM OR ALUMINIUM)
S6	111835	(NI OR NICKEL) (8N) (AL OR ALUMINUM OR ALUMINIUM)
S7	33532	(AL OR ALUMINUM OR ALUMINIUM) () (CONDUCT???? OR ELECTRODE? ? OR LINE OR LINES OR CIRCUIT OT FILM OR FILMS OR CIRCUITS OR - LAYER OR LAYERS OR METALIS? OR METALIZ?)
S8	248409	S3 OR S4 OR S7
S9	0	1AND2
S10	75	S1:S2 AND S8
S11	32624	5AND8
S12	19356	6AND8
S13	4074	11AND12
S14	6	10AND13

S15 76 S13 AND CONDUCTOR? ?
 S16 86 S13 AND SEMICONDUCT?????
 S17 6 15AND16
 S18 12 S14 OR S17
 S19 9 RD S18 (unique items)
 S20 103 S4 AND S15:S16
 S21 836 (AL OR ALUMINUM OR ALUMINIUM) () (NI OR NICKEL) () (CU OR COPP-
 ER)
 S22 1478 (AL OR ALUMINUM OR ALUMINIUM) () (CU OR COPPER) () (NI OR NICK-
 EL)
 S23 64 3AND7
 S24 15 10AND23
 S25 0 15AND23
 S26 0 16AND23
 S27 0 20AND23
 S28 5 20AND21
 S29 1 20AND22
 S30 1 7AND21
 S31 10 7AND22
 S32 73 4AND21
 S33 317 4AND22
 S34 0 S1:S3 AND S32
 S35 0 S1:S3 AND S33
 S36 0 21AND23
 S37 0 22AND23
 S38 30 S24:S31 NOT S18
 S39 27 RD S38 (unique items)
 S40 199 (AL OR ALUMINUM OR ALUMINIUM) () (NI OR NICKEL) () (CU OR COPP-
 ER)/TI
 S41 239 (AL OR ALUMINUM OR ALUMINIUM) () (CU OR COPPER) () (NI OR NICK-
 EL)/TI
 S42 1 7AND40
 S43 0 7AND41
 S44 45 (AL OR ALUMINUM OR ALUMINIUM) () (CU OR COPPER) () (NI OR NICK-
 EL) ()ALLOY
 S45 53 (AL OR ALUMINUM OR ALUMINIUM) () (NI OR NICKEL) () (CU OR COPP-
 ER) ()ALLOY
 S46 0 7AND44
 S47 0 7AND45
 S48 6 SEMICONDUCT????? AND (S40:S41 OR S44:S45)
 S49 42 S18 OR S38 OR S42
 S50 5 S48 NOT S49
 S51 4 RD S50 (unique items)

51/9/2 (Item 1 from file: 350)
 DIALOG(R)File 350:Derwent WPIX
 (c) 2002 Thomson Derwent. All rts. reserv.

007678432

WPI Acc No: 1988-312364/198844

XRAM Acc No: C88-138289

XRPX Acc No: N88-236852

Prodn. of **aluminium-copper-nickel alloy** wire - by
 normalising alloy, drawing obt'd. rough wire and annealing, used for
 bonding **semiconductor** element to outer lead terminal

Patent Assignee: NIPPON LIGHT METAL CO (NIMI)

Number of Countries: 001 Number of Patents: 001

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 63230845	A	19880927	JP 8763220	A	19870318	198844 B

Priority Applications (No Type Date): JP 8763220 A 19870318

Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
JP 63230845	A		5		

Abstract (Basic): JP 63230845 A

Al-Cu-Ni alloy including 0.005-3.0% Cu,
 0.005-0.5% Ni and less than 0.001% impurities, is formed into rough
 wire by normalising to produce a longitudinally oriented columnar
 crystal structure, drawn into a final dia. by cold working and annealed
 at 320-550 deg.C..

Title Terms: PRODUCE; ALUMINIUM; COPPER; NICKEL; ALLOY; WIRE; NORMALISE;
 ALLOY; DRAW; OBTAIN; ROUGH; WIRE; ANNEAL; BOND; **SEMICONDUCTOR**;
 ELEMENT; OUTER; LEAD; TERMINAL

Derwent Class: L03; M26; U11; X12

International Patent Class (Additional): C22C-021/12; C22F-001/05;
 H01B-001/02

File Segment: CPI; EPI

Manual Codes (CPI/A-N): L04-C11A; M26-B09; M26-B09C; M26-B09N

Manual Codes (EPI/S-X): U11-A09; U11-D03B1; U11-E01A; X12-D01A

39/9/21 (Item 5 from file: 350)
 DIALOG(R)File 350:Derwent WPIX
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004188477

WPI Acc No: 1985-015357/198503

XRAM Acc No: C85-006381

XRPX Acc No: N85-010907

Aluminium-nickel-copper alloy conductor body - of
 increased strength and heat-resistance

Patent Assignee: FURUKAWA ELECTRIC CO LTD (FURU)

Number of Countries: 001 Number of Patents: 002

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 59211547	A	19841130	JP 8385541	A	19830516	198503 B
JP 91032624	B	19910514	JP 8385541	A	19830516	199123

Priority Applications (No Type Date): JP 8385541 A 19830516

Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
JP 59211547	A		3		

Abstract (Basic): JP 59211547 A

Conductor body is made of heat resistant **Al alloy** comprising, by wt. 1.5-6.0% **Ni**, 0.02-0.3% **Cu** and balance **Al** and impurities. After the alloy is formed into a roughly drawn wire by continuous or semicontinuous cast rolling, it is heat treated at 200-500 deg. C for 0.5-10 hours.

USE/ADVANTAGE - The **Al alloy** is used as a power transmission wire instead of Al-Zr alloy which must be heat-treated at high temps. (300-450 deg. C) for long periods. The alloy has improved strength and heat resistance due to dispersion of NiAl₃ in the matrix. Strength and heat resistance are further enhanced by the Cu.

FAMILY Members // Equivalents to

6/17/02 09/648,455

09/648,455

L1 ANSWER 3 OF 4 WPIX (C) 2002 THOMSON DERWENT
AN 2002-142679 [19] WPIX
DNN N2002-107999 DNC C2002-044059
TI Semiconductor device has material layer including aluminum formed on one side of silicon substrate, and metal wiring of aluminum, copper and nickel at predefined intervals on substrate.
DC L03 U11
PA (HITA) HITACHI LTD
CYC 2
PI JP 2001127157 A 20010511 (200219)* 7p H01L021-768
KR 2001050232 A 20010615 (200219) H01L021-768
ADT JP 2001127157 A **JP 1999-310641 19991101**; KR 2001050232 A KR 2000-50197 20000828
PRAI **JP 1999-310641 19991101**
IC ICM H01L021-768
ICS H01L021-28; H01L021-3205
AB JP2001127157 A UPAB: 20020321
NOVELTY - The specific material layer formed on main surface side of the silicon substrate (1) includes aluminum. The wirings made up of aluminum, copper and nickel, are formed on the substrate. Intervals (28,29) of 0.4 μ m or less of thickness, are maintained between the wirings.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for semiconductor device manufacture.
USE - Semiconductor device.
ADVANTAGE - Improves yield of reliable semiconductor device with short circuit generation prevention structure using simple technique.
DESCRIPTION OF DRAWING(S) - The figure shows section of semiconductor device.
Silicon substrate 1
Wiring intervals 28,29
Dwg.1/10

FILE 'INPADOC, HCAPLUS, WPIX, JAPIO' ENTERED AT 10:41:19 ON 17 JUN 2002

L1 4 S JP99-0310641/PRN,AP

FILE 'INPADOC, HCAPLUS, WPIX, JAPIO' ENTERED AT 10:43:25 ON 17 JUN 2002

L2 10525 S IWASAKI T?/IN,AU

L3 8426 S MIURA H?/AU,IN

L4 3115 S OHTA H?/AU,IN

L5 1528 S NISHIHARA S?/AU,IN

L6 336 S SAHARA M?/AU,IN

L7 613 S (L2 OR L3 OR L4 OR L5 OR L6) AND (ALUMINUM OR ALUMINIUM OR ALUMINUM/CN OR (AL(4A)(COPPER OR CU) AND AL(4A)(NICKEL OR NI)))

L8 58 S L7 AND HITACHI?/PA,CS

L9 7 S L8 AND CONDUCTOR

FILE 'REGISTRY' ENTERED AT 10:49:45 ON 17 JUN 2002

L10 1 S ALUMINUM/CN

L11 1 S NICKEL/CN

L12 1 S COPPER/CN

L13 108157 S ALUMINUM ALLOY

L14 7327 S L13 AND (CU/MAC OR CU/ELS) AND (NI/MAC OR NI/ELS)

L15 596 S AL.CU.NI/MF

L16 0 S L14 AND (DOPE### OR DOPANT####)

L17 3 S L14 AND 3/ELC

L18 7326 S L14 NOT COMPD

L19 7124 S L18 NOT (OXIDE OR O/MAC OR O/ELS)

L20 3596 S L19 AND AL>50/MAC

FILE 'HCAPLUS' ENTERED AT 10:56:28 ON 17 JUN 2002

E SEMICONDUCTOR DEVICE/CT

L21 165416 S "SEMICONDUCTOR DEVICES"/CT OR CELLS/CT OR)

L22 102792 S ("SOI DEVICES"/CT OR "SCHOTTKY DIODES"/CT OR)

L23 28537 S ("FIELD EFFECT TRANSISTORS"/CT OR HFETS/CT OR)

L24 3 S L15 AND (L21 OR L22 OR L23)

L25 8 S L15 AND SEMICOND#####

L26 17 S L20 AND ((L21 OR L22 OR L23) OR SEMICOND#####)

L27 25 S (L24 OR L25 OR L26)

S ALUMINUM/CN(L)(DOPE### OR DOPANT)

FILE 'REGISTRY' ENTERED AT 11:02:05 ON 17 JUN 2002

L28 1 S ALUMINUM/CN

FILE 'HCAPLUS' ENTERED AT 11:02:06 ON 17 JUN 2002

L29 263421 S L28

L30 3362 S L29 (L)(DOPE### OR DOPANT)

L31 4786 S L29(L)(NI OR NICKEL)

L32 5937 S L29(L)(CU OR COPPER)

L33 445 S L31 AND L32

L34 1 S L30 AND L33

L35 158 S L30 AND (L31 OR L32)

L36 23 S L35 AND ((L21 OR L22 OR L23) OR SEMICOND#####)

L37 48 S (L27 OR L36)

FILE 'HCAPLUS' ENTERED AT 11:07:47 ON 17 JUN 2002

L38 120289 S ("ELECTRIC CONDUCTORS"/CT OR CONDUITS/CT) OR ELECTRODES/CT

L39 5 S L37 AND (L38 OR METALLIS? OR METALIS? OR METALIZ? OR METALLIZ?)

L40 7 S L37 AND CIRCUIT

L41 6016 S (AL OR ALUMINUM OR ALUMINIUM)(W)(CONDUCT##### OR ELECTRODE)

L42 1 S L37 AND L41

FILE 'HCAPLUS' ENTERED AT 11:07:47 ON 17 JUN 2002

L43 1414 S L11(L)("DOPED WITH")
 L44 2857 S L12(L)("DOPED WITH")
 L45 568 S L12(L)(DOPANT)
 L46 2724 S L12(L)(IMPURITY)
 L47 359 S L11(L)(DOPANT)
 L48 2202 S L11(L)(IMPURITY)
 L49 3 S L37 AND (L43 OR (L47 OR L48))
 L50 8 S L37 AND ((L44 OR L45 OR L46))
 L51 10 S (L49 OR L50)
 L52 9 S L51 NOT (L39 OR L40 OR L42)
 L53 66 S (CU OR COPPER OR NI OR NICKEL)(W)DOPED(W)(AL OR ALUMINUM OR ALUMINIUM)
 L54 7 S L53 AND ((L21 OR L22 OR L23) OR SEMICOND#####)
 L55 6 S L54 NOT (L51 OR L39 OR L40 OR L42)
 L56 21 S (AL OR ALUMINUM OR ALUMINIUM)(W)(DOPED WITH)(W)(NI OR NICKEL)
 L57 12 S (NI OR NICKEL)(W)DOPED(W)(AL OR ALUMINUM OR ALUMINIUM)
 L58 11 S L57 NOT (L54 OR L51 OR L39 OR L40 OR L42)
 L59 359 S L11(L)DOPANT
 L60 3574 S L11(L)(DOPED OR IMPURITY)
 L61 421 S (L59 OR L60) AND ((L21 OR L22 OR L23) OR SEMICOND#####)
 L62 143 S (AL OR ALUMINUM OR ALUMINIUM OR L28) AND L61
 L63 5657 S L28(L)(DOPED OR IMPURITY OR DOPANT)
 L64 100 S L62 AND L63
 L65 97 S L64 NOT (L57 OR L54 OR L51 OR L39 OR L40 OR L42)
 L66 3 S (AL OR ALUMINUM OR ALUMINIUM)/TI AND L65
 L67 3 S L65 AND CONDUCTOR
 L68 8 S L65 AND ELECTRODE
 L69 0 S L65 AND LINES
 L70 4 S L65 AND CIRCUIT
 L71 0 S L65 AND (METALLIS? OR METALLIZ?)
 L72 3 S L65 AND (METALIS? OR METALIZ?)
 L73 17 S L65 AND SUBSTRATE
 L74 4 S L65 AND SIDE
 L75 0 S L65 AND MAIN FACE
 L76 2 S L65 AND FACE
 L77 29 S (L67 OR L68 OR L69 OR L70 OR L71 OR L72 OR L73 OR L74 OR L75 OR L76) NOT (L66 OR L57 OR L54 OR L51 OR L39 OR L40 OR L42)

L77 ANSWER 2 OF 29 HCAPLUS COPYRIGHT 2002 ACS
 AN 2002:136093 HCAPLUS
 DN 136:192723
 TI **Semiconductor** device bump contact structure with dopants
 IN Chiu, Shih-Kuang; Tsai, Ying Chou; Suo, Chao-Dung; Mao, Kuo-Liang
 PA Siliconware Precision Industries Co., Ltd., Taiwan
 SO U.S., 5 pp.
 CODEN: USXXAM
 DT Patent
 LA English
 IC ICM H01L023-48
 ICS H01L023-52; H01L029-40
 NCL 257781000
 CC 76-3 (Electric Phenomena)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 6348740	B1	20020219	US 2000-654812	20000905
AB	<p>The present invention relates to a bump structure having dopants therein. More particularly, the present invention relates to the incorporation of dopants into the base material to fabricate the bump structure of a flip chip package. The bump structure includes a substrate, a plurality of bonding pads, a die and a plurality of bumps. The substrate has a 1st surface. The plurality of bonding pads is formed on the 1st surface of the substrate. The die has an active surface. Each bump at least includes a base and a plurality of dopants. The bumps are formed on the active surface of the die. The active surface of the die faces the 1st surface of the substrate. The substrate and the die are aligned such that each bump on the die corresponds with a bonding pad on the substrate. Dopants in the bump structure are made to contact the bonding pads on the substrate.</p>				
IT	<p>7429-90-5, Aluminum, uses RL: DEV (Device component use); USES (Uses) (bond pad; semiconductor device bump contact structure with dopants)</p>				
IT	<p>7440-50-8, Copper, uses RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses) (bump contact dopant, bond pad; semiconductor device bump contact structure with dopants)</p>				
IT	<p>7439-92-1, Lead, uses 7440-02-0, Nickel, uses 12735-99-8 RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses) (bump contact dopant; semiconductor device bump contact structure with dopants)</p>				

L39 ANSWER 5 OF 5 HCAPLUS COPYRIGHT 2002 ACS
 AN 1985:625722 HCAPLUS
 DN 103:225722
 TI **Semiconductor** device
 PA Toshiba Corp., Japan
 SO Jpn. Tokkyo Koho, 2 pp.
 CODEN: JAXXAD
 DT Patent
 LA Japanese
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 60030104	B4	19850715	JP 1976-89039	19760728
AB	A lead wire for a semiconductor device consists of a Cu alloy contg. Al 8-13, and Ni 5-10 wt.%. The lead wire has a good adhesion property with respect to a resin.				
IT	99353-77-2 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses) (lead wires, for semiconductor devices)				
RN	99353-77-2 HCAPLUS				
CN	Copper alloy, base, Cu 77-87, Al 8-13, Ni 5-10 (9CI) (CA INDEX NAME)				

Component	Component Percent	Component Registry Number
Cu	77 - 87	7440-50-8
Al	8 - 13	7429-90-5
Ni	5 - 10	7440-02-0

17jun02 11:17:16 User259284 Session D1837.1

File 2:INSPEC 1969-2002/Jun W3
 (c) 2002 Institution of Electrical Engineers

Set	Items	Description
S1	2	CI=(AL EL(S)CU DOP(S)NI DOP) (S)NE=3
S2	7	CI=(AL EL(S)CU EL(S)NI EL) (S)NE=3
S3	2	CI=(AL EL(S)CU EL(S)NI DOP) (S)NE=3
S4	2	CI=(AL EL(S)CU DOP(S)NI EL) (S)NE=3
S5	2	CI=(AL SS(S)CU DOP(S)NI EL) (S)NE=3
S6	2	CI=(AL SS(S)CU DOP(S)NI DOP) (S)NE=3
S7	3	S3:S6
S8	33	(CU OR COPPER) ()DOPED() (AL OR ALUMINUM OR ALUMINIUM)
S9	4	(NI OR NICKEL) ()DOPED() (AL OR ALUMINUM OR ALUMINIUM)
S10	0	8AND9
S11	6	S8 AND SEMICOND???????????

9/9/3

DIALOG(R) File 2:INSPEC

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01543129 INSPEC Abstract Number: B80034845

Title: Electromigration mechanism in aluminium conductors

Author(s): von Staszewski, G.M.; Walsoe de Reza, N.E.

Author Affiliation: Solid State Dept., Argentine Armed Forces Inst. for Sci. & Tech. Res. (CITEFA), Buenos Aires, Argentina

Journal: Solid-State Electronics vol.23, no.5 p.481-5

Publication Date: May 1980 Country of Publication: UK

CODEN: SSELA5 ISSN: 0038-1101

Language: English Document Type: Journal Paper (JP)

Treatment: Experimental (X)

Abstract: The mechanism of electromigration in the aluminium conductors of integrated circuits has been studied with radioactive tracers (Al/²⁶ and Ni/⁶³) employing high resolution autoradiographic techniques. It has been proved that the mass transport from the negative to the positive pole takes place predominantly by migration through the aluminium film grain boundaries. The surface diffusion mechanism was discarded as an important contribution to the process. Measurements of MTF (mean time to failure) in pure aluminium and in **nickel-doped aluminium** (200-700 ppm of nickel) showed a ten-fold advantage for the doped conductor. The electromigration activation energy of doped specimens was determined from the MTF variation with temperature. (13 Refs)

17jun02 11:55:45 User259284 Session D1837.4

SYSTEM:OS - DIALOG OneSearch

File 350:Derwent WPIX 1963-2002/UD,UM &UP=200237

(c) 2002 Thomson Derwent

*File 350: Please see HELP NEWS 350 for details about U.S. provisional applications. Also more updates in 2002.

File 347:JAPIO Oct 1976-2002/Feb(Updated 020604)

(c) 2002 JPO & JAPIO

*File 347: JAPIO data problems with year 2000 records are now fixed. Alerts have been run. See HELP NEWS 347 for details.

File 94:JICST-EPlus 1985-2002/Apr W4

(c)2002 Japan Science and Tech Corp(JST)

*File 94: There is no data missing. UDs have been adjusted to reflect the current months data. See Help News94 for details.

File 32:METADEX(R) 1966-2002/Aug B1

(c) 2002 Cambridge Scientific Abs

*File 32: See Help Codes32 for a list of the Alloy Class Codes(CC=) and Alloy Class Names(CN=) used in Metadex.

File 335:Ceramic Abstracts 1976-2002/Q1

(c) 2002 Cambridge Scientific Abs.

Set	Items	Description
S1	2980	CS=FURUKAWA ELEC?
S2	39219	PA=FURUKAWA ELEC?
S3	182	CS=NIPPON LIGHT METAL?
S4	5313	PA=NIPPON LIGHT METAL?
S5	47659	S1:S4
S6	445	(AL OR ALUMINUM OR ALUMINIUM) () (NI OR NICKEL) () (CU OR COPP- ER)
S7	716	(AL OR ALUMINUM OR ALUMINIUM) () (CU OR COPPER) () (NI OR NICK- EL)
S8	8	S5 AND S6:S7
S9	87564	(AL OR ALUMINUM OR ALUMINIUM) ()ALLOY
S10	2688	S5 AND S9
S11	122323	(NI OR NICKEL) AND (CU OR COPPER)
S12	958	CUPRONICKEL? OR CUPRO()NICKEL?
S13	0	10AND12
S14	135	10AND11
S15	8	S14 AND CONDUCTOR?
S16	4	S14 AND SEMICONDUCT?????
S17	18	S8 OR S15:S16
S18	18	RD S17 (unique items)
S19	2	S14 AND (TRANSISTOR? OR FET OR FETS OR MOS OR MOSFET? OR F- IELD()EFFECT)
S20	1	S19 NOT S17
S21	12	S14 AND SUBSTRATE??
S22	11	S21 NOT (S17 OR S19)
S23	11	RD S22 (unique items)

18/9/1 (Item 1 from file: 350)
 DIALOG(R) File 350:Derwent WPIX
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013363929 **Image available**
 WPI Acc No: 2000-535868/200049
 XRAM Acc No: C00-160303
 XRPX Acc No: N00-396482

Die cast piston for direct injection type internal combustion engine of vehicle, is made of **aluminum-nickel-copper** group crystal material with predefined amount of potassium
 Patent Assignee: **NIPPON LIGHT METAL CO** (NIMI)
 Number of Countries: 001 Number of Patents: 001
 Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 2000204428	A	20000725	JP 994018	A	19990111	200049 B

Priority Applications (No Type Date): JP 994018 A 19990111

Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
JP 2000204428	A		7	C22C-021/02	

Abstract (Basic): JP 2000204428 A

NOVELTY - The piston is formed with crystallization cast structure containing silicon with particle diameter 5-10 mum, aluminum-nickel group and **aluminum-nickel-copper** crystals. The amount of potassium in the piston per 1cc/100 g of aluminum is 0.01 pieces/cm2.

DETAILED DESCRIPTION - The Al alloy piston contains 11-16 weight percent (wt.%) of Si, 0.5-2.0 wt.% of Mg, 3-7 wt.% of Cu, 3-7 wt.% of Ni, 0.2-1.5 wt.% of Fe, 0.2-1.0 wt.% of Mn, 0.003-0.15 wt.% of P, 0.002 or less wt.% of Ca. The amount of impurities is regulated to less than 0.2 wt.%. An INDEPENDENT CLAIM is also included for the manufacture of die cast piston.

USE - For direct injection type internal combustion engines of vehicles.

ADVANTAGE - Excels in fatigue strength at high temperature and antiwear quality due to the copper composition of potassium.

pp; 7 DwgNo 1/1

18/9/5 (Item 5 from file: 350)
 DIALOG(R) File 350:Derwent WPIX
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004250638

WPI Acc No: 1985-077516/198513

XRAM Acc No: C85-033803

XRPX Acc No: N85-057925

High strength heat resistant **aluminium alloy conductor**

- contains zirconium iron, silicon, **copper**, and **nickel**

Patent Assignee: **FURUKAWA ELECTRIC CO LTD** (FURU

Number of Countries: 001 Number of Patents: 002

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 60029456	A	19850214	JP 83139218	A	19830729	198513 B
JP 91006984	B	19910131	JP 83139218	A	19830729	199109

Priority Applications (No Type Date): JP 83139218 A 19830729

Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
JP 60029456	A		5		

Abstract (Basic): JP 60029456 A

Molten **Al alloy** consisting by wt. of Zr 0.1-0.8%, Fe 0.07-0.8%, Si 0.05-0.8%, **Cu** 0.005-0.5%, **Ni** 0.005-0.5% and the balance Al with incidental impurities, is continuously or semicontinuously cast at above 740 deg. C as an ingot. The ingot is hot-rolled, immediately without reheating, to be roughly drawn and heat-treated at 200-500 deg. C for 0.5-200 hrs. and cold-worked to be drawn.

ADVANTAGE - The alloy is increased in strength. The Zr is sufficiently solid-soln. dissolved by casting at above 740 deg. C and pptd. in the successive processes.

0/0

Title Terms: HIGH; STRENGTH; HEAT; RESISTANCE; ALUMINIUM; ALLOY;
CONDUCTOR; CONTAIN; ZIRCONIUM; IRON; SILICON; **COPPER**;

18/9/15 (Item 8 from file: 347)
DIALOG(R)File 347:JAPIO
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01746954

MANUFACTURE OF LEAD FRAME OF SEMICONDUCTOR DEVICE

PUB. NO.: 60-225454 [JP 60225454 A]
PUBLISHED: November 09, 1985 (19851109)
INVENTOR(s): SHIGA SHOJI
TANIGAWA TORU
APPLICANT(s): **FURUKAWA ELECTRIC CO LTD THE** [000529] (A Japanese
Company or Corporation), JP (Japan)
APPL. NO.: 59-081059 [JP 8481059]
FILED: April 24, 1984 (19840424)
INTL CLASS: [4] H01L-023/48; H01L-021/60
JAPIO CLASS: 42.2 (ELECTRONICS -- Solid State Components)
JAPIO KEYWORD: R002 (LASERS); R007 (ULTRASONIC WAVES)
JOURNAL: Section: E, Section No. 391, Vol. 10, No. 79, Pg. 134, March
28, 1986 (19860328)

ABSTRACT

PURPOSE: To obtain the titled lead frame of high reliability excellent economically by a method wherein the bonding parts of the leads frame are coated with necessary micro spots.

CONSTITUTION: At least a kind of Au, Ag, Pd, Ni, Cu, Al or alloys of these such as Au-Ag, Ag-Pd, Pd-Ni, **Al-Ni**, **Cu-Ni**, Al-Si, Ag-In, Ag-Zn and Cu-Ag is put on the wire bonding parts of inner leads in spot form and then irradiated with laser beams into a fusion coat. From the view-point of workability, it is preferable that a fine-powder paste is dripped or injected and screen-printed to this metal. In other words, a fine powder 0.01-0.1.mu.m in grain size produced by vapor phase reaction is the best. A high-output type such as YAG or CO(sub 2) laser is used for the laser light source. This is made to scan by condensation to a size corresponding to the metal-coated part or to about 0.1mm.phi.. Since this light source yields an energy density of 10(sup 4)-10(sup 8)W/cm(sup 2), spot coating can be accomplished by fusion and quench in a short time of 1-10(sup -10)sec.

18/9/17 (Item 10 from file: 347)
DIALOG(R)File 347:JAPIO
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01550956

PRODUCTION OF **CONDUCTOR** CONSISTING OF HIGH-STRENGTH HEAT-RESISTANT
ALUMINUM ALLOY

PUB. NO.: 60-029456 [JP 60029456 A]
PUBLISHED: February 14, 1985 (19850214)
INVENTOR(s): YANASE HITOSHI
MIYAUCHI MICHIO
APPLICANT(s): **FURUKAWA ELECTRIC CO LTD THE** [000529] (A Japanese
Company or Corporation), JP (Japan)
APPL. NO.: 58-139218 [JP 83139218]
FILED: July 29, 1983 (19830729)
INTL CLASS: [4] C22F-001/04; B22D-011/06; C22C-021/00; H01B-001/02
JAPIO CLASS: 12.2 (METALS -- Metallurgy & Heat Treating); 12.3 (METALS --
Alloys); 12.4 (METALS -- Casting); 41.1 (MATERIALS --
Conductive Materials)
JOURNAL: Section: C, Section No. 288, Vol. 09, No. 153, Pg. 5, June
27, 1985 (19850627)

ABSTRACT

PURPOSE: To produce an **Al alloy** wire for power transmission
having excellent strength and flexibility without decreasing conductivity
and heat resistance by adding a small amount of Fe to an Al-Zr alloy having
excellent resistance to heat and subjecting the alloy to hot rolling and
heat treatment under specific conditions then to cold drawing.

CONSTITUTION: The melt of an **Al alloy** containing 0.1-0.8% Zr,
0.07-0.8% Fe, 0.05-0.8% Si, 0.005-0.5% Cu and 0.005-0.5% Ni is
continuously or semi-continuously cast at $\geq 740^{\circ}\text{C}$. The billet is
immediately hot-rolled without heating the same to produce a roughly drawn
wire. The roughly drawn wire is heated for 0.5-2.00hr at $200-500^{\circ}\text{C}$ to
improve strength, etc. owing to precipitation of Zr and thereafter the wire
is cold drawn to a wire rod. The **Al alloy** wire having excellent
strength, heat resistance and flexibility as a steel cored **Al**
alloy twisted wire to be used for a power transmission wire is
obtained

20/9/1 (Item 1 from file: 347)
 DIALOG(R)File 347:JAPIO
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05072993

MANUFACTURE OF **ALUMINUM ALLOY**-MADE SCROLL

PUB. NO.: 08-028493 [JP 8028493 A]
 PUBLISHED: January 30, 1996 (19960130)
 INVENTOR(s): ICHINOSE AKIRA
 YAMAGUCHI SUEKICHI
 APPLICANT(s): **FURUKAWA ELECTRIC CO LTD THE** [000529] (A Japanese
 Company or Corporation), JP (Japan)
HIGASHI NIPPON TANZOU KK [000000] (A Japanese Company or
 Corporation), JP (Japan)
 APPL. NO.: 06-161634 [JP 94161634]
 FILED: July 14, 1994 (19940714)
 INTL CLASS: [6] F04D-029/30; B21J-003/00; B21J-005/02; B21K-001/36;
 C22C-021/02; C22F-001/043
 JAPIO CLASS: 24.1 (CHEMICAL ENGINEERING -- Fluid Transportation); 12.2
 (METALS -- Metallurgy & Heat Treating); 12.3 (METALS --
 Alloys); 12.5 (METALS -- Working); 26.2 (TRANSPORTATION --
 Motor Vehicles)

ABSTRACT

PURPOSE: To improve productivity without requiring any cutting work by
 molding a scroll by only one time casting work through a process of using a
 disc-like casting material obtained from the specific **aluminum**
alloy extruding member.

CONSTITUTION: **Aluminum alloy** is used as a casting material,
 containing Si of 1.0 to 15.0wt.%, Fe of 0.1 to 1.0wt%, **Cu** of 1.0 to
 5.0 wt.%, Mg of 0.2 to 1.5wt.%, Mn of 0.1 to 0.5wt.%, Cr of 0.05 to
 0.5wt.%, **Ni** of 0.05 to 1.0wt.%, and Ti of 0.3wt.%, and composed of
 residual Al and avoidable impurities. This casting material is molded by
 only one time casting work by using cold casting lubricating oil containing
MoS (sub 2) under the condition that the casting mold temperature is
 100 to 150 deg.C, the material temperature is 200 to 350 deg.C, and the ram
 descending speed is strength 100 to 800mm/sec. Thereby the scroll excellent
 in of product and in dimensional precision can be obtained without any
 cutting work, and without increasing costs.

23/9/2 (Item 2 from file: 350)
 DIALOG(R)File 350:Derwent WPIX
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012258926

WPI Acc No: 1999-065032/199906

XRAM Acc No: C99-019813

XRPX Acc No: N99-048376

Aluminium@ alloy board for magnetic disc **substrate** -
 has core layer containing magnesium@, **copper@** and zinc@, with a
 coating layer on one or both sides

Patent Assignee: **FURUKAWA ELECTRIC CO LTD** (FURU

Number of Countries: 001 Number of Patents: 001

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 10310836	A	19981124	JP 97120012	A	19970512	199906 B

Priority Applications (No Type Date): JP 97120012 A 19970512

Patent Details:

Patent No	Kind	Lan Pg	Main IPC	Filing Notes
JP 10310836	A	8	C22C-021/06	

Abstract (Basic): JP 10310836 A

Aluminium alloy board has a core layer on one or both
 sides of which a coating layer is formed. The coating layer contains,
 in wt.%, 2.0-6.0 Mg, 0.01-0.15 **Cu**, 0.05-2.0 Zn, 0.01-0.40 Mn,
 0.01-0.30 Cr, 0.01-0.12 Zr, 0.01-0.05 **Ni**, 0.05 or less Si, 0.05
 or less Fe, and 0.02 or less Ti.

The core layer contains Mg, **Cu**, Zn, and optionally Mn, Cr,
 Zr, and **Ni**.

Between the coating and core layers, the ratio of Si and Fe is 1.3
 or less, the ratio of Mg, **Cu** and Zn is 0.7-1.3, and the ratio of
 Cr, Mn, Zr and **Ni** is less than 1.0.

ADVANTAGE - Has good adhesion. The surface is smooth, and produces
 a high density magnetic disc. Does not increase cost as pure metal is
 needed only for coating layer. Enables reuse of waste coating material
 for core material.

Dwg.0/0

Title Terms: ALUMINIUM; ALLOY; BOARD; MAGNETIC; DISC; **SUBSTRATE**; CORE